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Indian Standard

SPECIFICATION FOR 'READY-TO-EAT' PROTEIN-RICH EXTRUDED FOODS

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SPECIFICATION FOR 'READY-TO-EAT' PROTEIN-RICH EXTRUDED FOODS

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Indian Standard

SPECIFICATION FOR 'READY-TO-EAT' PROTEIN-RICH EXTRUDED FOODS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 29 April 1980, after the draft finalized by the Nutrition Sectional Committee had been approved by the Agricultural and Food Products Division Council.

0.2 'Ready-to-eat' protein-rich extruded foods are made by a process known as 'Extrusion cooking'. This is a process by which pre-conditioned raw food material is subjected to high-temperature-short-time cooking, which results in the material becoming of plastic consistency. This material is then extruded through specially tapered dies. As it emerges from the dies it passes from a high pressure to a low pressure zone and this results in puffing of the product. Size and shape of the product may be according to good manufacturing practices.

0.2.1 'Ready-to-eat' protein-rich extruded foods have a potential for usage in nutrition programmes throughout the country with the object of improving the nutritional well-being of pre-school and school-going children. These foods could also be of importance during emergency needs related to natural calamities like floods, cyclones, epidemics and famine conditions. In addition they can be used as nutritive snacks by all.

0.2.2 Several types of such foods have been recently introduced under different names. To safeguard the health of the consumers which are mainly children, and at the same time provide guidelines for manufacture of such foods, it has been felt necessary to prescribe requirements for them.

0.3 This standard does not define any particular composition of the 'ready-to-eat', protein-rich extruded foods, but leaves the option of using different types of raw materials of vegetable origin and animal origin (milk or milk products) in optional proportions, to the manufacturer. This standard specifies only the minimum level of nutrients in the end products and the quality of protein in terms of protein efficiency ratio (PER). The standard also lays down specification for microbial limit and freedom from anti-nutritional characters.

0.4 Other related standard brought out in this field are listed on page 14.

0.5 While formulating this standard, necessary consideration has been given to the relevant rules prescribed by the Government of India, under the Prevention of Food Adulteration Act, 1954. Consideration has also been given to the Weights and Measures (Packaged Commodities) Rules, 1977. However, this standard is subject to restrictions imposed under these wherever applicable.

0.6 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard prescribes the requirements and methods of sampling and test for 'Ready-to-eat' protein-rich extruded foods.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply.

2.1 Type Tests — Tests (*see* **3.3**) to prove the conformity to the requirements of this standard. They are intended to approve the formulation and quality of the product at least in the beginning of marketing and/or certification. These tests may also be conducted whenever the basic formula is changed.

2.2 Acceptance Tests (Sampling Tests) (*see* 3.2) — Tests carried out on samples selected from the lot for the purpose of acceptance of the lot.

3. REQUIREMENTS

3.1 Raw Materials — The following raw materials may be used for the production of 'Ready-to-eat' protein-rich extruded foods. They should be clean and of good quality and should conform to the relevant Indian Standards.

a) Dehusked cereals and millets;
b) Dehusked pulses;

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*Rules for rounding off numerical values (*revised*).

c) Dehusked edible oilseeds, oilseed flours and oilseed protein concentrates and isolates;
d) Skim milk powder (conforming to IS : 1165-1975*);
e) Sugar or jaggery;
f) Vegetable fats and oils;
g) Salt;
h) Spices and condiments; and
j) Edible tubers and starches.

3.2 Acceptance Tests

3.2.1 *Description* — The method of production shall be extrusion cooking. The cooker extruder configuration used for the purpose of extrusion cooking shall ensure adequate cooking of raw ingredients. The shape and size of the extruded product shall be reasonable uniform, being governed by the nature of the die used for extrusion-cooking. The product shall be fully cooked. It shall also be free from extraneous matter and harmful material.

3.2.2 *Flavour* — The flavour of the 'ready-to-eat' protein-rich extruded foods shall be fresh and pleasant. The product shall not have a rancid taste or musty odour.

3.2.3 *Additives* — Preservatives, flavours and colours permitted under the Prevention of Food Adulteration Act, 1954 may be added.

3.2.4 The 'ready-to-eat' protein-rich extruded foods shall also comply with the requirements given in Table 1.

3.3 TYPE TESTS

3.3.1 *Protein Efficiency Ratio* — Protein efficiency ratio of the protein in the 'Ready-to-eat' protein-rich extruded foods shall be not less than 1·8 (corrected PER) when determined by the method given in IS : 7481-1974†.

3.3.2 *Aflatoxin* — The 'ready-to-eat' protein-rich extruded foods shall not have an aflatoxin content more than 30 μg/kg when tested according to the methed prescribed in Appendix K of IS : 4684-1975‡, if groundnut flour has been added to the product.

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*Specification for milk powder (*second revision*).

†Method for determination of protein efficiency ratio (PER).

‡Specification for edible groundnut flour (expeller pressed) (*first revision*).

TABLE 1 REQUIREMENTS FOR 'READY-TO-EAT' PROTEIN-RICH EXTRUDED FOODS

SL No.	CHARACTERISTIC	REQUIREMENT	METHOD OF TEST, REF TO
(1)	(2)	(3)	(4)
i)	Protein (expressed as N × 6·25), percent by mass, *Min*	16	IS : 7219-1973*
ii)	Moisture, percent by mass, *Max*	6·0	Appendix A of IS : 1011-1968†
iii)	Calories per 100 g, *Min*	340	By computation from proximate composition.
iv)	Total ash, percent by mass, *Max*	5·0	Appendix E of IS : 1547-1968‡
v)	Acid insoluble ash, percent by mass, *Max*	0·25	Appendix E of IS : 1011-1968†
vi)	Crude fibre (on dry basis), percent by mass, *Max*	3·00	Appendix A of IS : 1656-1969§
vii)	Total bacterial count, per g, *Max*	50 000	IS : 5402-1969‖
viii)	Coliform count, per g, *Max*	10	IS : 5401-1969¶
ix)	Selmonella	Nil	IS : 5887-1970**

*Method for determination of proteins in foods and feeds.

†Specification for biscuits (*first revision*).

‡Specification for infant milk foods (*first revision*).

§Specification for processed cereals weaning foods.

‖Method for plate count of bacteria in foodstuffs.

¶Methods for detection and estimation of coliform bacteria in foodstuffs.

**Methods for detection of bacteria responsible for food poisoning and food-borne diseases.

3.3.3 *Gossypol* — The 'ready-to-eat' protein-rich extruded foods shall not have free gossypol content more than 0·065 percent by mass and total gossypol content more than 1·10 percent by mass, when tested according to the method prescribed in Appendix A of IS : 4874-1968*, if cottonseed flour has been added to the food product.

3.3.4 *Urease Activity* — The 'ready-to-eat' protein-rich extruded foods shall not show a change in *p*H by more than 0·1 when determined by the method given in Appendix D of IS : 7837-1975†, if soya flour has been added to the product.

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*Specification for edible cottonseed flour (expeller pressed).

†Specification for edible full-fat soya flour.

3.3.5 *Oxalic Acid* — The ' ready-to-eat ' protein-rich extruded food shall not have any oxalic acid content more than 0·5 percent when tested according to the method prescribed in Appendix B of IS : 6109-1971* if sesame flour has been added to the food.

3.3.6 Protein rich extruded foods when used for feeding programmes shall comply with the requirement given in Table 2. In case they are meant for general consumption, the option for fortification is left to the manufacturer or is subject to agreement between the buyer and the seller. However, if any claims of fortification are made, the product shall comply with the requirements given in Table 2.

TABLE 2 REQUIREMENTS OF VITAMINS AND MINERALS FOR 100 GRAMS OF ' READY-TO-EAT ' PROTEIN-RICH EXTRUDED FOODS

(*Clause* 3.3.6)

Sl No.	Characteristic	Requirement	Method of Test, Ref to
(1)	(2)	(3)	(4)
i)	Vitamin A, µg, *Min*	200	IS : 5886-1970*
ii)	Vitamin D, µg, *Min*	3·5	IS : 5835-1970†
iii)	Thiamine, mg, *Min*	0·5	IS : 5398-1969‡
iv)	Riboflavin, mg, *Min*	0·5	IS : 5399-1969§
v)	Nicotinic acid, mg, *Min*	5	IS : 5400-1969‖
vi)	Calcium, mg, *Min*	300	Appendix F of IS : 1656-1969¶
vii)	Iron, mg, *Min*	5	Appendix F of IS : 1656-1969¶
viii)	Vitamin B_2, µg, *Min*	0·5	*See* Note
ix)	Folic acid, µg, *Min*	50	*See* Note

NOTE 1 — As there are no rapid and routine methods for determining Vitamin B_{12} and folic acid content of the product, manufacturer should maintain a record showing the quantity of these vitamins added to the product.

*Methods of estimation of carotenes and Vitamin A (Retinol) in foodstuffs.

†Method for estimation of Vitamin D in foodstuffs.

‡Methods for estimation of thiamine (Vitamin B_1) in foodstuffs.

§Methods for estimation of riboflavin (Vitamin B_2) in foodstuffs.

‖Methods for estimation of nicotinic acid (niacin) in foodstuffs.

¶Specification for processed cereal weaning foods (*first revision*).

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*Specification for edible sesame flour (expeller pressed).

3.4 Hygienic Conditions — The product shall be processed, packed stored and distributed under hygienic conditions in licensed premises (*see* IS : 2491-1972*).

4. PACKING AND MARKING

4.1 Packing — The product shall be packed in any moisture-proof, clean and sound containers. It may be packed in moisture-proof paper bags (multilayered, polyethylene lined) or high density polyethylene woven bags having 300 gauge low density polyethyle liner for bulk (that is 10, 15, 20 and 25 kg) or in suitable moisture-proof multi-service containers.

Small quantities (that is 20 g to 250 g) for consumer market, may be packed in 250 gauge high density polyethylene bags, unless otherwise agreed to between the purchaser and the vendor in such a way as to protect it from deterioration.

4.2 Marking — The following particulars shall be marked or labelled on each containers:

a) Protein, fat and calories per 100 g;
b) Name of the material and trade name or brand name, if any;
c) Name and address of the manufacturer;
d) Batch or code number;
e) Net mass; and
f) Other labelling requirements according to the provision of the Standards of Weights & Meausres (Packaged Commodities) Rules, 1977.

4.2.1 Each container may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

5. SAMPLING

5.1 Representative samples of material shall be drawn as prescribed in Appendix A.

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*Code for hygienic conditions for food processing units (*first revision*).

6. TESTS

6.1 Tests shall be carried out as prescribed in **3.2** and **3.3** and Tables 1 and 2.

6.2 Quality of Reagents — Unless otherwise specified, pure chemicals and distilled water (*see* IS : 1070-1977*) shall be employed in tests.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the result of test analysis.

APPENDIX A

(*Clause* 5.1)

SAMPLING OF 'READY TO EAT' PROTEIN-RICH EXTRUDED FOODS

A-1. GENERAL REQUIREMENTS OF SAMPLING

A-1.0 In drawing, preparing, storing and handling samples, the following precautions and directions shall be observed.

A-1.1 Samples shall be taken in a protected place, not exposed to damp air, dust or soot.

A-1.2 The sampling instrument shall be clean and dry when used. When taking samples for bacteriological examination, it shall be sterile.

A-1.3 Precautions shall be taken to protect the samples, the material being sampled, the sampling instrument and the containers for samples from adventitious contamination.

A-1.4 The samples shall be placed in clean and dry containers. The sample containers shall be of such a size that they are almost completely filled with the sample. The sample containers shall in addition be sterile when they are used for samples for bacteriological examination.

A-1.5 Each container shall be sealed air-tight after filling and marked with full details of sampling, such as date of sampling, date of manufacture and batch number or code number, if any.

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*Specification for water for general laboratory use (*second revision*).

A-1.6 Samples shall be stored in such a manner that the temperature of the material does not vary unduly from the normal temperature.

A-2. SCALE OF SAMPLING

A-2.1 Lot — In any consignment all the containers of the same size and belonging to the same batch of manufacture shall be grouped together to constitute a lot.

A-2.2 For ascertaining the conformity of material in the lot to the requirements of the specification, samples shall be tested for acceptance tests from each lot separately.

A-2.3 The number of containers to be taken from the lot shall depend upon the size of the lot and shall be in accordance with col 1 and 2 of Table 3.

TABLE 3 SCALE OF SAMPLING

NUMBER OF CONTAINERS IN THE LOT (1)	SAMPLE SIZE (For Tests other than Microbiological) (2)	SUB-SAMPLE SIZE (For Microbiological Test) (3)
Up to 25	2	1
26 to 50	3	1
51 to 100	5	2
101 to 150	6	3
151 and above	8	4

A-2.3.1 The containers shall be chosen at random from the lot. In order to ensure the randomness of selection, reference may be made to IS : 4905-1968*. In case this standard is not readily available, the following procedure may be adopted.

> ' Starting from any container in the lot, count them in one order as 1, 2, 3............... up to *r* and so on where *r* is the integral part of *N*/*n*, *N* being the total number of containers in the lot and *n* the number of containers to be selected from the lot. Every *r*th container thus counted shall be withdrawn till the requisite number of containers is obtained '.

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*Methods for random sampling.

A-3. TEST SAMPLES AND REFEREE SAMPLES

A-3.1 Draw with a suitable sampling instrument, small portions of the material from different parts of each container selected according to **A-2.3.** The total quantity of material drawn from each container shall be sufficient to make triplicate determinations for all the characteristics given in the specifications.

A-3.2 Thoroughly, mix all portions of material drawn from the same container. Out of these portions, a small but approximately equal quantity of material shall be taken from each selected container and shall be well mixed so as to form a composite sample of the quantity of material sufficient to make triplicate determination for all the characteristics to be tested on the composite sample. This composite sample shall be divided into three equal parts, one for the purchaser, another for the vendor and third for the referee. Each of these parts shall be transferred to thoroughly clean and dry sample containers which shall be sealed air-tight and labelled with full identification particulars given in **A-1.5.**

A-3.3 The remaining portions of the material from each selected container (after a small quantity needed for the formation of the composite sample has been taken out) shall be divided into three equal parts. These parts shall be transferred to thoroughly clean and dry sample containers which shall be sealed air-tight and labelled with full identification particulars given in **A-1.5.** The material in each such container shall constitute a test sample. These individual samples shall be seperated into three identical sets of test samples in such a way that each set has a test sample representing each container selected according to **A-2.3.** One of these three sets shall be marked for the purchaser, another for the vendor and third for the referee.

A-3.4 From the containers selected according to col 1 and 2 of Table 3 the number of containers given in col 3 of Table 3 shall be randomly selected. Draw with a suitable sampling instrument, which is sterile, the representative quantity of material under aseptic conditions to form a sample of container for microbiological examination. Divide the sample (taking care not to bring in microbiological contamination in the material) into three equal parts. Each part so obtained shall constitute a test sample representing the container and shall be transferred to sterile containers, sealed airtight and labelled with full identification particulars given in **A-1.5**. These shall be marked, in addition, with the words ‘for microbiological examination ’. The samples so obtained shall be divided into three sets in such a way that each set has a sample representing each selected container. One of these sets shall be marked for the purchaser, another for the vendor and third for the referee.

A-3.5 Referee samples shall consist of a set of individual samples, the composite sample and a set of samples for microbiological examination marked for this purpose and shall bear the seals of the purchaser and the vendor. These shall be kept at a place agreed to between the purchaser and the vendor to be used in case of a dispute between the two.

A-4. NUMBER OF TESTS

A-4.1 Tests for the determination of moisture, protein, calories and total ash shall be conducted on each of the samples constituting a set of individual samples.

A-4.2 Tests for description, flavour, acid insoluble ash and crude fibre shall be conducted on the composite sample.

A-4.3 Tests for bacterial count and coliform count shall be conducted on each of the samples constituting a set of test samples labelled with the words ' for microbiological examination '.

A-5. CRITERIA FOR CONFORMITY

A-5.1 The lot shall be declared as conforming to the requirements of the specification if **A-5.1.1** to **A-5.1.3** are satisfied.

A-5.1.1 The test results on each of the individual samples satisfy the corresponding specification requirements.

A-5.1.2 All the test results on the composite sample satisfy the corresponding specification requirements.

A-5.1.3 The test results for bacterial and coliform count satisfy the corresponding specification requirements.

(*Continued from page* 2)

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INDIAN STANDARDS
ON
NUTRITIOUS FOODS

IS :

3137-1974	High protein mixes for use as food supplement (*first revision*)
4684-1975	Edible groundnut flour (expeller pressed) (*first revision*)
4874-1968	Edible cottonseed flour (expeller pressed) (*first revision*)
4875-1975	Edible groundnut flour (solvent extracted)(*first revision*)
4876-1968	Edible cottonseed flour (solvent extracted) (*first revision*)
6108-1971	Edible sesame flour(solvent extracted)
6109-1971	Edible sesame flour (expeller pressed)
7021-1973	Protein rich foods supplements for infants and preschool children
7481-1974	Method for determination of protein efficiency ratio (PER)
7482-1974	Protein-based beverages
7487-1974	Protein rich biscuits
7835-1975	Edible low-fat soya flour
7836-1975	Edible medium-fat soya flour
7837-1975	Edible full-fat soya flour
8211-1976	Edible soya protein isolate
8212-1976	Edible groundnut protein isolate
8220-1976	Protein rich concentrated nutrient supplementary foods
8222-1976	Edible leaf protein concentrate
8664-1977	Edible coconut flour (expeller pressed)
8665-1977	Protein fortified bread
8676-1977	Edible coconut flour (solvent extracted)
8677-1977	Edible sunflower seed flour(solvent extracted)
8678-1977	Vegetable protein-based yoghurt (vegetable curds)
9037-1979	Peanut butter
9038-1979	Reconstitutable protein beverage powder
9039-1979	Edible sunflower seed grits
9071 (Part I)-1979	Code of practice for control of aflatoxin in groundnuts: Part I Harvesting transport and storage of groundnut kernels
9071 (Part II)-1979	Code of practice for control of aflatoxin in groundnuts: Part II Plant storage and processing flour and oil
9095-1979	Protein chewy candy
9216-1979	Glossary of common terms relating to nutrition and nutritious foods
9487-1980	‘ Ready-to-eat ’ protein-rich extruded foods